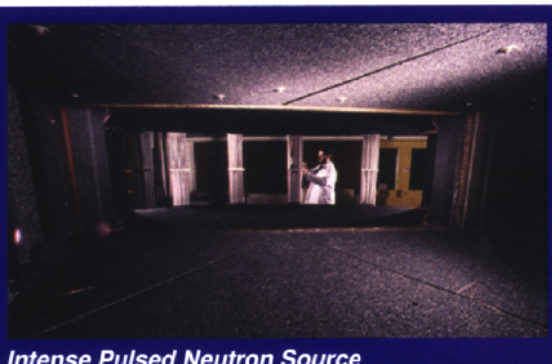
BES User Facilities

...a network of scientific resources

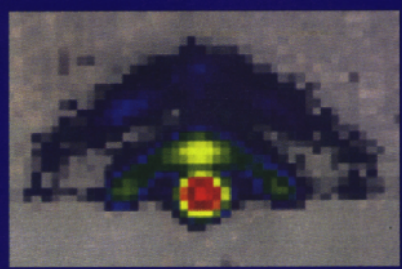
Today, the scientific establishment in the United States is a robust fabric of public and private research institutions, large national user facilities, and instrumentation located throughout the country. BES has a major responsibility for designing, constructing, and operating 17 of these complex scientific user facilities. Synchrotron light sources, high flux neutron sources, electron-beam microcharacterization centers, and other specialized facilities enable scientists to carry out experiments that could not be done in the laboratories of individuals. BES facilities are also key in developing next-generation instrumentation.

These facilities offer to outside researchers world-class capabilities for basic and applied research. The experiments conducted in BES user facilities embrace the full range of scientific and technological endeavors, including chemistry, physics, materials science, geology, environmental science, biology, biotechnology, and engineering science. The facilities offer a choice of methods for gathering information, ranging from structure at the atomic and molecular level to detailed maps of composition and chemical bonding — in short, all the features that determine the behavior of matter.

In a typical year, thousands of researchers and their students from academia, industry, and the federal laboratory system conduct research at these facilities. For approved experiments, operating time is available without charge to those scientists whose intent is to publish their results in the open literature. Proprietary research can also be accommodated on a full-cost-recovery basis. Over the past five years, the number of visitors using the facilities, including many from nations elsewhere around the globe, has grown more than threefold, especially evidenced in the increased number of industrial users.

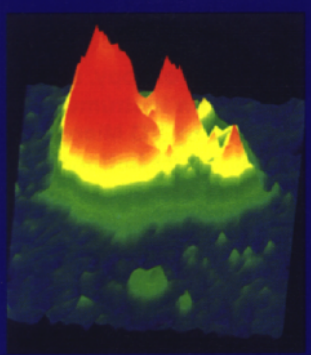


Intense Pulsed Neutron Source

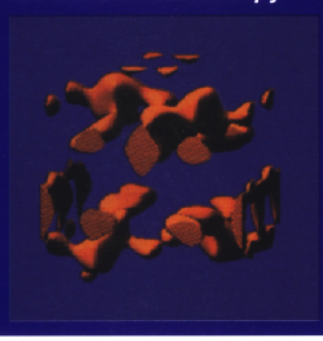


Complex fluids. *High Flux Isotope Reactor*

Diamond gear. *Surface Modification and Characterization Facility*

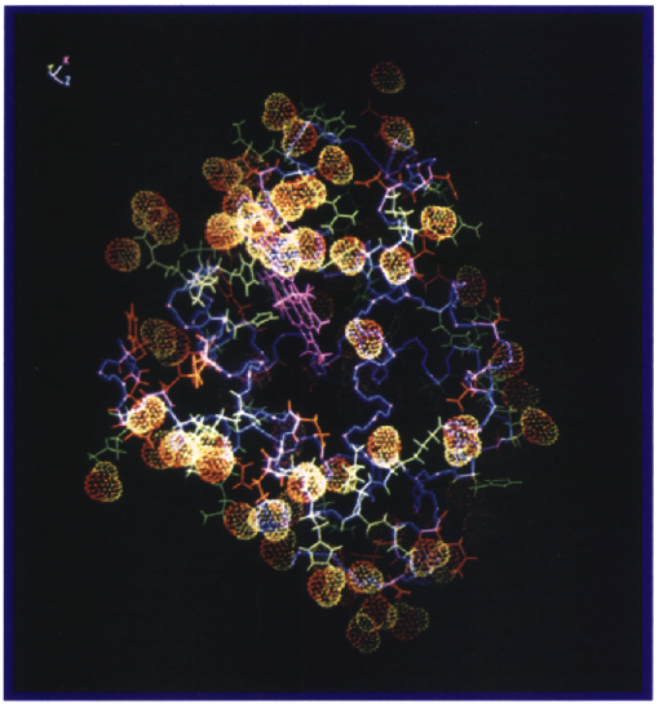


Chromium particle. *Advanced Light Source*



Atomic structure of staurolite. *National Center for Electron Microscopy*

The Advanced Photon Source



Skeletal model of myoglobin, a protein involved in respiration. *High Flux Beam Reactor*

Light Sources

Synchrotron light sources produce lightwaves (radiation) extending in the electromagnetic spectrum from infrared to X-rays. These beams of visible and invisible light enable researchers to probe, analyze, and image materials on a near-nanoscopic scale-including semiconductors, magnetic storage materials, composite materials, ceramics, polymers, pharmaceuticals, and biological molecules. Today, members from industry, academia, and the federal laboratories-and representing the materials sciences, physical and chemical sciences, geosciences, environmental sciences, biosciences, and medical and pharmaceutical sciences — use these synchrotron light sources to conduct state-of-the-art, cutting-edge research.

Advanced Light Source (ALS), Lawrence Berkeley National Laboratory

Advanced Photon Source (APS), Argonne National Laboratory

National Synchrotron Light Source (NSLS), Brookhaven National Laboratory

Stanford Synchrotron Radiation Laboratory (SSRL)

Neutron Sources

Neutrons have unique applications as probes in many scientific and technological fields. Neutron scattering has provided virtually all of the available information on the fundamental structure of the magnetic materials used in motors and generators, telecommunications, and video and audio technologies. Other applications of neutron scattering include biomolecular structure, polymer science, superconductivity, and the engineering properties of structural materials.

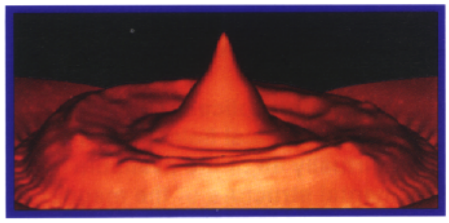
High Flux Beam Reactor (HFBR), Brookhaven National Laboratory

High Flux Isotope Reactor (HFIR), Oak Ridge National Laboratory

intense Pulsed Neutron Source (IPNS), Argonne National Laboratory

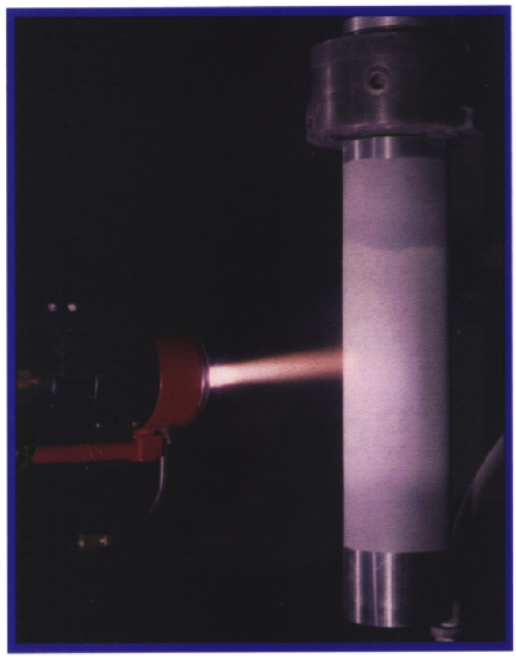
Neutron Scattering Center(LANSCE), Los Alamos National Laboratory

Miniaturized motors are created using deep-etch lithography, made possible by high-intensity X-rays. *Advanced Light Source, Lawrence Berkeley National Laboratory*



(left) A computer-enhanced pole-figure diagram of the X-ray diffraction from $CuInSe_2$. *Center for Microanalysis of Materials*

(below) Plasma arc spray coatings of quasicrystalline powders applied to metal surfaces improve wear and corrosion resistance. *Materials Preparation Center, Ames Laboratory, Iowa State University*



(below) The atomic resolution microscope. *National Center for Electron Microscopy at Lawrence Berkeley National Laboratory*

Microcharacterization Centers

BES electron-beam microcharacterization centers provide access to electron microscopes and other micro-analytical instruments and, thus, to unique capabilities for structural and chemical analyses.

Center for the Microanalysis of Materials (CMM), University of Illinois

Electron Microscopy Center, Argonne National Laboratory

National Center for Electron Microscopy (NCEM), Lawrence Berkeley National Laboratory

Shared Research Equipment Program (SHaRE), Oak Ridge National Laboratory

Other Facilities

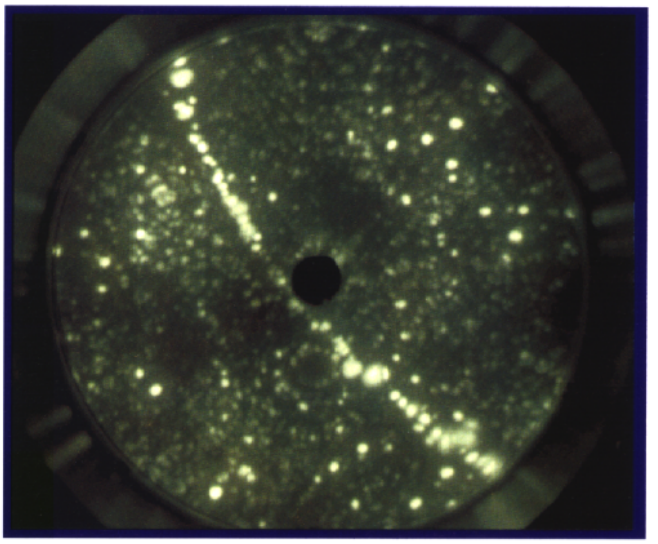
Combustion Research Facility (CRF), Sandia National Laboratories

Materials Preparation Center (MPC), Ames Laboratory

Surface Modification and Characterization Research Center (SMAC), Oak Ridge National Laboratory

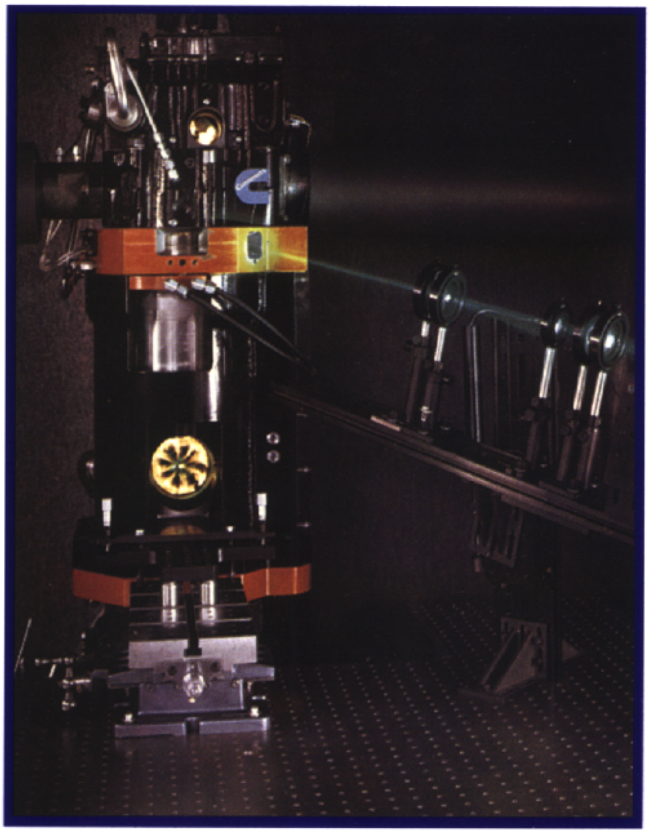
Pulse Radiolysis Facility (PRF), Notre Dame University

James R. MacDonald Laboratory, Kansas State University



Grain boundary in a Babcock & Wilcox pressure vessel steel weld docorated with an ultrathin film of molybdenum-carbonitride precipitate (color-enhanced). ***Shared Research Equipment Program (SHaRE), Oak Ridge National Laboratory***

Lasers measure an operating diesel engine. ***Combustion Research Facility, Sandia National Laboratories***



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